

## Original Article

### Dental caries and treatment needs of Yemeni children with down syndrome

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#### ABSTRACT

**Background:** Oral health in Down syndrome (DS) children has some peculiar aspects that must be considered in the follow-up of these patients. The objective of the present study was to assess the prevalence of dental caries and treatment needs among children with DS in Yemen and also to investigate the association between these outcomes with various socio-demographic and clinical variables.

**Materials and Methods:** This cross-sectional study involved 96 children with DS aged between 6 and 15 years. Data were gathered through the use of a questionnaire and clinical observation. The dentition status and the treatment needs were recorded according to World Health Organization recommendations. ANOVA, Chi-square test, t-test and multiple regression analyses were applied using the statistical package for the social sciences (SPSS, Chicago, IL, USA) version 20.0 software, with  $P < 0.05$  considered as significant.

**Results:** The results showed that 93.8% of the subjects had dental caries; overall, decayed missing filled surfaces (dmfs), decayed missing filled teeth (dmft), DMFS, DMFT were 10.35, 4.44, 4.32 and 2.45, respectively. Stepwise linear regression analysis has revealed that age was the most important predictor for DMFT and DMFS, while early age and less frequent teeth brushing were the most predictors for dmft and dmfs. Restorative care and extractions were the most needed specific treatments.

**Conclusion:** The findings of this study demonstrate that children with DS in Yemen have a high prevalence of dental caries and extensive unmet needs of dental treatment. They would benefit from frequent oral health assessment.

**Key Words:** Dental caries, down syndrome, risk factors, yemen

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## INTRODUCTION

Down syndrome (DS) is an autosomal chromosomal disorder caused by trisomy of all or a critical part of chromosome 21.<sup>[1]</sup> DS affects approximately 1 in 600-700 live births globally.<sup>[2]</sup> DS has also been referred to by the terms Trisomy 21, Trisomy G or Mongolism.<sup>[2]</sup> Clinically, it is characterized by

generalized hypotonia, neurological changes, structural cardiopathy, respiratory problems and a greater risk of infection, dental anomalies and orofacial dysmorphism, which therefore requires special attention in the dental treatment of these patients.<sup>[1-5]</sup>

DS children have specific orofacial features. The most common oral findings in these children include mouth breathing, open bite, macroglossia, fissured lips and tongue, delayed teeth eruption, missing and malformed teeth, microdontia, crowding, malocclusion and bruxism.<sup>[4-7]</sup>

Caries is the most common chronic disease of childhood and can have a direct and devastating impact on the patients' overall health, especially for those with certain systemic health problems.<sup>[6,8]</sup> Caries

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is a multifactorial infectious disease and there are a lot of different factors that affect its occurrence.<sup>[8,9]</sup>

The oral health problems observed in these patients show some differences compared with the general population. A majority of published studies have reported that patients with DS have lower rates of caries than those without DS.<sup>[4,6,10]</sup> Nonetheless, several studies have found that people with and without DS share the same caries rates while other studies have reported higher caries rates in those with DS.<sup>[11,12]</sup>

Individuals with DS need more assistance from caretakers with their daily oral health care; a 3-month-supervised tooth-brushing program conducted twice a week on Kuwaiti children with DS was evaluated and showed that the mean plaque score decreased from 1.93 to 0.95 ( $P < 0.001$ ).<sup>[13]</sup> Many of the previous studies showed extensive treatment needs among children with disabilities. It appeared that a relatively high proportion of these children did not usually receive any form of professional care.<sup>[3,14]</sup>

In Yemen, there is no data available regarding dental health status of individuals with DS. Therefore, the current study aimed to assess the prevalence of dental caries and treatment needs among children with DS and also to investigate the association between dental caries with various socio-demographic and clinical variables in these subjects.

## MATERIALS AND METHODS

This cross-sectional study included all children with DS attending day institutions for individuals with special needs in Sana'a city, Yemen. At the time, this study was carried out (February, 2013), there were 120 children with DS attending three schools for mentally handicapped. Subjects with systemic diseases, compound disability, extremely uncooperative and those without parents consents were excluded from the study. The total eligible sample comprised of 96 children aged between 6 and 15 years.

Consents for participation in the study were obtained from parents and head teachers of the schools. A self-administered questionnaire, previously used by Al-Hussyeen and Al-Sadhan,<sup>[15]</sup> was filled by the participant's parents prior to clinical examination. The questionnaire was tested earlier and some modifications were made. It included data about oral hygiene practices, dietary habits and parent's education background.

Clinical examination was carried out at the respective institutions using artificial light, plain mouth mirror and dental probe. Dental caries and treatment needs were assessed using the decayed missing filled teeth (DMFT/dmft) and treatment need indices as recommended by the World Health Organization's oral health surveys.<sup>[16]</sup> All examinations were performed by a single precalibrated examiner.

Intelligence quotient (IQ) level for each subject was assessed using the Wechsler intelligence scale for children. The study was approved by the Research and Ethics Committee of the Faculty of Medicine and health sciences, Sana'a University.

Statistical package for the social sciences (SPSS) version 20.0 (SPSS Inc., Chicago, IL, USA) was used for data entry and analysis. Descriptive statistics such as percentages and frequencies for categorical data and means and standard deviations for numerical data were determined. The categorical outcomes were analyzed by Chi-square tests, whereas the quantitative outcomes (DMFT/dmft and their components) were analyzed by either *t*-test or ANOVA, as appropriate.

Stepwise multiple linear regression analyses were executed to analyze the association between various socio-demographic (age, sex, teeth brushing frequency, parents education, frequency of sweets intake) and clinical variables (IQ level), with dependent variables (DMFT, decayed missing filled surfaces [DMFS], dmft and dmfs). A significance level of  $P < 0.05$  was considered.

## RESULTS

Of the 96 participants in the study, 62% were males. The ages ranged from 6 to 15 years (mean:  $10.15 \pm 2.76$ ). The majority of subjects (66.7%) were moderately mentally retarded. Only 8.3% of the subject's mothers and 24.0% of the fathers completed university education. Approximately, 76% of subjects ( $n = 55$ ) reported regularly brushing their teeth either once a day ( $n = 48$ ) or at least twice a day ( $n = 7$ ), [Table 1].

The prevalence of caries was 93.8%. The mean dmft was  $4.44 \pm 3.389$ , while the mean DMFT was  $2.45 \pm 3.04$ , with no significant difference across gender ( $P > 0.5$ ). The decayed component of dmft and DMFT indexes was the largest component (mean  $3.83 \pm 3.11$  and  $2.10 \pm 2.71$  for dt and DT, respectively), while the mean filling component was

the smallest (mean  $00.00 \pm 00.00$  and  $0.09 \pm 0.53$  for f and F components, respectively) [Table 2].

Table 3 shows the mean scores of dmft and DMFT and their components in various age groups. The highest DMFT/DMFS scores were among the 12-14 year age group, while the highest dmft/dmfs were among the 6-8 year age group and the differences between age subgroups were highly significant ( $P < 0.01$ ).

**Table 1: Demographic and characteristics of the study subjects (n = 96)**

Characteristics	N	Percentage	Mean (SD)
Sex			
Male	60	62.5	
Female	36	37.5	
Age (years)			
6-8	28	29.2	10.15
9-11	27	28.1	(2.76)
12-15	41	42.7	
IQ			
Mild	20	20.8	
Moderate	64	66.7	
Severe	12	12.5	
Frequency of brushing			
Once a day	48	50	
At least twice a day	7	7.3	
Irregular	21	21.9	
Never	20	20.8	
Mother education			
No schooling	33	34.4	
Elementary	39	40.6	
Secondary	16	16.7	
University	8	8.3	
Father education			
No schooling	12	12.5	
Elementary	30	31.3	
Secondary	31	32.3	
University	23	24	

IQ: Intelligence quotient; SD: Standard deviation

**Table 2: DMFT, dmft and their components by gender**

Variables	Male	Female	Total	P value*
DMFT	2.29±3.09	2.73±2.96	2.45±3.04	0.504
D	2.02±2.85	2.24±2.46	2.10±2.71	0.692
M	0.22±0.61	0.33±0.92	0.26±0.73	0.533
F	0.05±0.39	0.15±0.71	0.09±0.53	0.462
dmft	4.33±3.55	4.62±3.17	4.44±3.38	0.730
d	3.63±3.25	4.15±2.90	3.83±3.11	0.494
m	0.70±1.77	0.42±0.94	1.498±0.18	0.413
f	0.00±0.00	0.00±0.00	0.00±0.00	1.000 <sup>a</sup>

\*t-test; SD: Standard deviation; NS: Non-significant; DMFT: Decayed missing and filled teeth; <sup>a</sup>Cannot be computed because SDs of both groups are 0

Stepwise multiple linear regressions revealed that the best predictor for caries status in permanent teeth was the age that explained variance of 38.5% and 27.2% for DMFT and DMFS, respectively. The best predictors in descending order for caries status in primary teeth (dmft) were: age and frequency of teeth brushing, which explained a variance of 24.4% and 17.7% for dmft and dmfs, respectively [Table 4].

Table 5 presents dental treatment needs in the study population. The need for restorative treatment was high; 87.5% of the subjects required one surface filling and 40.6% required two surface fillings. The need for extraction came next (19.8%) followed by the need for veneer treatment (16.7%). Females showed significantly a higher need for 2 surface fillings than males did ( $P < 0.05$ ).

## DISCUSSION

The characterization of the level of oral health in a population is important in order to establish priorities

**Table 3: DMFT, dmft and their components by age groups**

Variables	6-8 years	9-11 years	12-15 years	P value
DMFT	0.33±0.91	1.30±1.85	4.44±3.26	0.001
D	0.33±0.91	1.30±1.85	3.66±3.02	0.001
M	00±00	00±00	0.59±1.02	0.001
F	00±00	00±00	0.20±0.78	0.154
dmft	5.54±3.91	4.41±2.72	1.73±1.61	0.006
d	4.54±3.67	3.96±2.59	1.73±1.61	0.028
m	1±1.98	0.41±1.08	00±0.00	0.035
f	0.00±0.00	0.00±0.00	0.00±0.00	1.000

\*ANOVA test; SD: Standard deviation; ANOVA: Analysis of variance; DMFT: Decayed missing and filled teeth

**Table 4: Stepwise multiple linear regression for predictors of dental caries**

Model	R	R <sup>2</sup>	Adjusted R <sup>2</sup>	SE of estimate	P value
DMFT					
1	0.626 <sup>a</sup>	0.392	0.385	2.38	0.001
DMFS					
1	0.529 <sup>a</sup>	0.280	0.272	6.07	0.001
dmft					
1	0.392 <sup>b</sup>	0.154	0.140	3.14	0.001
2	0.517 <sup>c</sup>	0.267	0.244	2.94	0.001
dmfs					
1	0.356 <sup>d</sup>	0.127	0.113	10.57	0.001
2	0.449 <sup>e</sup>	0.202	0.177	10.19	0.001

<sup>a</sup>Predictors: (Constant), age; <sup>b</sup>Predictors: (Constant), age; <sup>c</sup>Predictors: (Constant), age, frequency of teeth brushing; <sup>d</sup>Predictors: (Constant), age; <sup>e</sup>Predictors: (Constant), age, frequency of teeth brushing; DMFT: Decayed missing and filled teeth; DMFS: Decayed missing and filled surface; SE: Standard error

**Table 5: Distribution of dental treatment needs among subjects by gender N (%)**

Gender	1 surface F	2 surface F	Crown	Pulp	Extraction	Prevent	Veneer
Male	53 (88.3)	18 (30)	9 (15)	6 (10)	13 (21.7)	2 (3.3)	9 (15)
Female	31 (86.1)	21 (58.3)*	6 (16.7)	2 (5.6)	6 (16.7)	1 (2.8)	7 (19.4)
Total	84 (87.5)	39 (40.6)	15 (15.6)	8 (8.3)	19 (19.8)	3 (3.1)	16 (16.7)

Chi-square test \* $P < 0.05$ 

concerning preventive and therapeutic activities. In health care planning, it is essential to identify and quantify the necessities of the target population.

In the present study, the prevalence of dental caries in the total sample was 93.8%, which is comparable with that in normal children of a similar age in Sana'a.<sup>[17]</sup> However, this figure is much higher than that reported in previous studies among DS individuals in Europe,<sup>[6]</sup> India,<sup>[14]</sup> Israel,<sup>[18]</sup> Japan<sup>[19]</sup> and Malaysia.<sup>[20]</sup>

This result also contradicts previous published studies, which reported a reduced rate of dental caries in individuals with DS. Stabholz *et al.* found that 84% of young subjects with DS were free from caries.<sup>[18]</sup> Morinushi *et al.* conducted a study in 1995 to evaluate the incidence of dental caries in 75 DS children in the age group of 2-18 years.<sup>[19]</sup> They found 46.1% of these children with 61.4% of children below the age of 5 years to be caries-free. Barnett *et al.* compared the prevalence rates of periodontitis and dental caries in 30 DS patients and 30 matched intellectual disability controls.<sup>[21]</sup> The results revealed a greater prevalence of periodontitis and a lower prevalence of dental caries in DS patients compared with the intellectual disability controls. The literature attributes the low prevalence of caries in individuals with DS to factors such as eruptive pattern, higher prevalence of bruxism, dental morphology, salivary composition and differences in the composition of the microbiota.<sup>[18,19]</sup>

Consistently, dmft and DMFT scores from the above studies are also generally much lower than reported in our study. The higher incidence of caries in our sample could be attributed to the lack of awareness about dental visits, irregular dietary habits, inadequate oral hygiene measures, lack of fluoridated water and easy availability of high sucrose-containing cheap food stuffs, parental neglect and lack of initiative toward prevention.

No significant difference was found in caries experience between male and female subjects, which is in agreement with previous reports.<sup>[3,10,22]</sup> As no differences were found between males and females, it is probable that behavioral differences are of less importance in this disabled population.

In agreement with previous reports, the present study revealed that caries experience is associated with age.<sup>[20,23]</sup> This is due to the fact that dental caries is irreversible and accumulative. The multivariate analysis also showed that frequency of teeth brushing was significantly associated with caries experience in primary teeth (dmft). The commonly accepted frequency recommended by Frandsen for tooth brushing is twice a day.<sup>[24]</sup> In this study, only 7.3% of the subjects reported brushing at least twice a day. A considerable percentage (42.7%) did not brush their teeth, which reflects the negligence of parents and caregivers toward oral health. In an earlier study on Finnish children with mental retardation, the most important determinant of caries risk was their poor standard of oral hygiene.<sup>[25]</sup> It has been demonstrated that poor oral hygiene, which is directly associated with plaque score, contributes to high prevalence of dental caries in people with DS.<sup>[10,26]</sup> Although the role of oral cleanliness as a determinant of caries risk is, in general, regarded as controversial, a very poor level of oral hygiene seems to be associated with increased caries risk.<sup>[27]</sup> Therefore, efforts must be made to encourage the parents and school teachers of these children to promote and improve their oral health. Dental health education should be provided to parents and school teachers to improve the oral health of this social group.

The need for systemic oral health care has been clearly demonstrated in this study as DS children and adolescents had a higher decayed component d/D, while missing (M) and filling (F) component were too low in percentage. The dental caries pattern reflects the fact that population has poor access to restorative dental care and negligible sign of preventive care. In the specific treatment category, the children in this study commonly required restorative treatments such as one-surface fillings (87.5%), two-surface fillings (40.6%) and extraction (19.8%). There are many factors contributing to large unmet treatment need among DS population. Lack of knowledge about good oral hygiene practices among parents, care takers and concerned authorities, lack of motivation, low priority

given to dental care in society, lack of facility for early and regular oral health check-up and prompt treatment and finally cost of the treatment may be the reason for accumulated treatment needs.

## CONCLUSION

It can be concluded from this study that individuals with DS in Yemen have a high prevalence of caries and extensive unmet needs of dental treatment. This study also suggests that oral health promotion programs should be introduced to special care schools with parental education as an integral component of such programs.

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